VOLUME IV NUMBER 5 FEBRUARY 1989 PRICE 3.50

EXPERIMENTAL MUSICAL INSTRUMENTS

FOR THE DESIGN, CONSTRUCTION AND ENJOYMENT OF NEW SOUND SOURCES

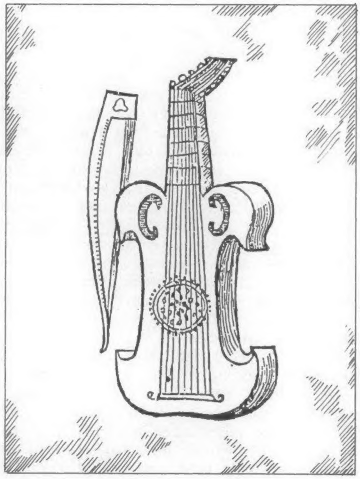
ANYTHING'S POSSIBLE

FULL, AS ALWAYS, of good things.

Leading the list of articles in this issue of EMI is a piece devoted to several contemporary makers who work with string instruments of unusual shape and form. Included are descriptions of zither-like things, violin-like things, guitar-like things, lyre-like things, dream-like things, in a handsome array of contours and configurations. Also among this issue's articles you will find a piece on the musical possibilities of eggshell (more than one might expect), and, at the center-fold, a sound spectrum chart for the full audible frequency range, giving pitch names, frequencies, wavelengths, and diverse landmarks along the way.

OK! We turn now to the subject of creative string instrument figuration.

IN THIS ISSUE



Above right: GROSS GEIGEN, from Musica Getutscht by Sebastian Virdung, 1511.

SHAPE AND FORM, CONTEMPORARY STRINGS

On the pages that follow you will see the work of several creative makers of plucked and bowed string instruments. The instruments shown here for the most part follow familiar methods for producing and amplifying the vibration. Where they differ from the familiar is in overall shape and form: in these builders' hands, necks and sound chambers take on unusual and unexpected contours.

Most string instruments (aside from electric ones) amplify the string vibrations by feeding

(continued on page 15)

LETTERS

EMI has received an unusual amount of worthwhile mail since the last issue. This "Letters" section is longer than usual as a result. Notice in particular Peter Fischer's interesting and educative letter on instrument making in the classroom (page 6), which includes some very workable designs, as well as thoughts on what works and what doesn't. Also, Spike Jones fans should note a lot of additional Spike-ography on page (following up last issue's Spike Jones review), thanks to Hal Rammel and others.

TONY PIZZO (EMI VOL IV #3)'S REVIEW of Luigi Russolo's Art of Noises was welcome. Another interesting book of futurist manifestos in art and music is the Blau Reiter [Blue Rider] Almanac, first published in 1912 (full reference below). It has articles by Arnold Schoenberg ("The Relationship to the Text"), Thomas von Hartmann ("On Anarchy in Music"), and Wassily Kandinsky ("The Yellow Sound: A Stage Composition"). "The world sounds. It is a cosmos of spiritually effective beings. Even dead matter is living spirit." (Kandinsky).

Also mentioned was Attali's Noise: The Political Economy of Music (reference below). This is a brilliant essay, well worth reading. Attali is an economist and an advisor to France's President Francois Mitterand. He has some extraordinary insights into the relations of music, politics and economics in the history of the Western world. Anyone who has wondered at the ineptitude in dealing with music in Bloom's The Closing of the American Mind will be enlightened by Attali's essay, and perhaps stimulated to wonder about the musical sensibility of our own politicos, political scientists and philosophers. Attali's essay is also "futurist:" "music is a herald, for change is inscribed in noise faster than it transforms society." Attali contends that music-making has, potentially, prophetic functions. What is done in music today, and the way it is done, somehow anticipates tomorrow's social arrangements. The notion is not especially new. Plato's political theories were based on extensive consideration of musical practices, what has been called the "aesthetic prefiguration" of political, social, and economic organization. But Attali has, nevertheless , some very fresh things to say that Plato could not even have dreamed of, about John Cage, for example.

Another "futurist" work is Ernst Bloch's Essays in the philosophy of music, recently published in translation (see below). This is more intricate and difficult (for me) reading. Bloch is concerned with the nature of utopian visions, hopes, dreams, and desires, which he believes are uniquely embodied in music. Music has for Bloch, in Jean Paul's phrase, "a power of nostalgia, not for an old county we have left behind, but for a virgin one, not for a past but for a future." But some of Bloch's ideas are a little chilling: "All we hear is ourselves."

None of these works have anything to do with musical instruments specifically, although they are all concerned very much with the importance of experimentation in music, and the way in which musical experience portends major consequences. Recall Albert Einstein's pithy remark: "The theory of relativity occurred to me by intuition, and music is the driving force behind this intuition. My parents had me study the violin from the time I was six. My new discovery is the result of musical perception."

A curious thing about these books, too, is that they all seem to be advocating that it is time to forego reading and writing. "For twenty-five centuries, Western knowledge has tried to look upon the world. It has failed to understand that the world is not for the beholding. It is for hearing. It is not legible, but audible." (Attali 1985:3).

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So I guess I'd better go retune the strings and muse awhile on the results.

Charles R. Adams

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Bloch, Ernst. 1985 Essays on the philosophy of music. Peter Palmer, trans., with an introduction by David Drew. Cambridge: Cambridge University Press. (About $16 in paperback; originally published in German, 1974.)

Attali, Jacques. 1985 Noise: The Political Economy of Music. Brian Massumi, trans; foreword by Frederic Jameson, afterword by Susan mcClary. Minneapolis: University of Minnesota Press (Theory of History and Literature, Vol. 16). (Originally published in French, 1977.)

Kandinsky, Wassily, and Franz Marc (eds.). 1974 The Blau Reiter Almanac. Documentary edition by Klaus Lankheit. New York: Viking Press ("The Documents of 20th Century Art").

Also in this series of publications:

Memoirs of a Dada Drummer by Richard Huelsenbeck, ed. by Hans Kleinschmidt

Rhythmic Color and Simultaneity: The Writings of Sonia and Robert Delaunay, ed. by Arthur A. Cohen.

GREETINGS FROM DOWN SOUTH ****

Rainy season finally hit here. Lots of rust out in the back yard -- things which I have no room in the garage or the house for.

The last two months I have been grinding out copy tapes. More new scales and some effects I have been waiting as long as fifty years to hear! Finally, the instruments to do this, and the means of copying the recordings so that other people can hear also.

Hopefully, your generation will be spared the problem that went all through my life -- I mean ever since 1928 when I was eleven and wanting to go beyond the piano at home and try out the organ and other instruments and almost always was denied access to them.

Motivation toward building instruments? It goes back all those sixty years! Nobody would let me try this or go where such-and-such an instrument was. This went on for decades. A reason for you running your magazine? What better one could I give you?

What I mean here is, there must be young people out there who are being denied access to instruments to try them, and your readers could reach out and allow them to see and try unusual instruments so their minds won't be cramped and closed by not being allowed to experiment or even DREAM ABOUT experimenting someday.

This kind of helping doesn't cost anything.

Much the same applies to new scales and tuning systems. So I am grinding out copy after copy of the tapes I recently made up with new tunings on the synthesizer and the two organs that were sent me by Richard Koerner and Buzz Kimball respectively. A new possibility has opened, and it is almost unremarked and unnoticed: Namely: Until the last ten years, it was almost impossible for anyone to tune a new scale other than ordinary twelve-tone

(continued overleaf)

EMI'S COVER PRICE

A note from the editor

Experimental Musical Instruments has always been primarily oriented toward subscription sales. Just recently, however, the number of newsstands carrying EMI has increased several fold. This has drawn more attention to the cover price. At $3.50 EMI is expensive when compared, pound for pound and page for page, to the mass circulation magazines with which it is now sharing shelf space.

Naturally, we would love to put out Experimental Musical Instruments at a price comparable to that of popular general interest magazines. That is not possible though, and here are some reasons why:

Most large publications are in the business of building huge circulations by any means possible, and that includes selling subscriptions and newsstand copies at a loss. This enables them to sell advertising space at mind-boggling rates. It is common for such publications to devote more than half of their space to paid advertising, and this is the source of most of their revenue. They also pick up some cash by selling their mailing lists. From a purely pecuniary point of view, their business is not so much selling magazines to readers; it is selling readers to advertisers.

All this need not necessarily be considered a bad thing -- after all, it gives us our daily papers and news magazines at a fraction of the cost of producing them, in much the same way that we get TV for free. But EMI, because of the nature of its subject matter, will never have the numbers to join in that game. Our prices have to actually reflect the cost of production. And, because those modest numbers preclude many economies of scale, EMI's per copy production and fulfillment costs unavoidably are substantially higher larger circulation magazines.

But by the same token EMI has several redeeming features. First of all, it is always jam-packed with interesting stuff. To control printing costs and give readers the most for their money, EMI has what has got to be one of the most crowded layouts in the business. That goes against conventional wisdom in the graphic design field, but we do it anyway. In addition, very little of EMI's space is taken up with advertising; EMI has never pursued ads as a major source of income. And the advertising that we do have is for goods and services of interest to EMI's readers -- no Surgeon General's warnings on the back cover.

In short, a typical issue of EMI has about as much meat as a typical magazine two or three times its size. EMI's prices, meanwhile, have remained the same since the newsletter's inception several years ago. And we can add that while those prices may be higher than Time and Newsweek, they are quite modest compared to the prices of many other specialized newsletters --which, believe it or not, often exceed a hundred dollars annually for publications containing no more pages per year than EMI.

So what you get when you subscribe to EMI is valuable information unavailable anywhere else in the world, at a realistic price unsubsidized by outside commercial interests. That's the best we can do, and within those parameters we serve as many people as possible as well as we can.

or a limited number of pitches of just intonation. Then in the seventies, a variety of tuning devices and frequency counters and other equipment became available. Now you don't have to have a specially-trained ear anymore.

Ironically enough, the makers of these new tuning devices (and in the case of the frequency counter, not primarily designed for anything whatever to do with music) weren't even interested nor knowledgeable about any new scales. It's just a lucky accident -- the devices are now available without anyone really intending to open the new scales to composers and instrument makers and performers. That's why it isn't generally known. Back in 1935 or 1958, it was almost but not quite impossible to do a new tuning even if you wanted to. It would have taken much longer to tune an instrument to a new system than to build it. So the cost in TIME was prohibitive.

Once the new tunings can be recorded and the recordings copied, the copying of a new tuning onto another instrument becomes fairly easy. And once a guitar is refretted, it is simple enough to tune something else to that.

What have the uptight perfectionists done for you lately? Don't let them spoil your fun.

Ivor Darreg

I'M DELIGHTED TO HAVE FOUND OUT about EMI. It's great to find so many other people interested in the same things I am.

I started a band ("World 48") which plays in a 7-tone equal scale. We use a copper tubing marimba, a copper flute, electric zither (with piano wire), 7-tone electric bass/guitar (played like a Chapman Stick) and electric chimes (using threaded rods and guitar pickups). Re-tuned violin and organ are our only conventional instruments.

I especially appreciate descriptions of tunings and of other publications that deal more with tunings. New instruments and new tunings are closely related.

Clem Fortuna
516 Hawthorne
Royal Oak, MI 48067

P.S. Did anyone respond to your April 1987 question about a continuous strip keyboard? There is a model of electric organ by Yamaha which has such a strip (monophonic) over the keyboard. If anyone ever makes a polyphonic strip I'd like to hear about it.

From the editor -- Yes, there was some further discussion of continuous keyboards in the letters section of the issues following April '87, but this is the first word we've gotten of the Yamaha product.

AS YOUR READERS WILL PERHAPS HAVE READ in the Winter 1987 and Winter 1988 issues of **Computer Music Journal**, it is my hope to build a keyboard, with 72 notes to the octave, running a synthesizer under computer control, for the performance of my -- and of course any other -- microtonal music.

I enclose a drawing of it.

Since the first version must be as inexpensive as possible, I expect it would send only an ON-OFF signal, and might even have immobile keys, activated only by being touched (though I should hope that in that case, they could be made -- by means of conductive rubber under the pads, or some such scheme -- to respond only to a touch of over some threshold force.

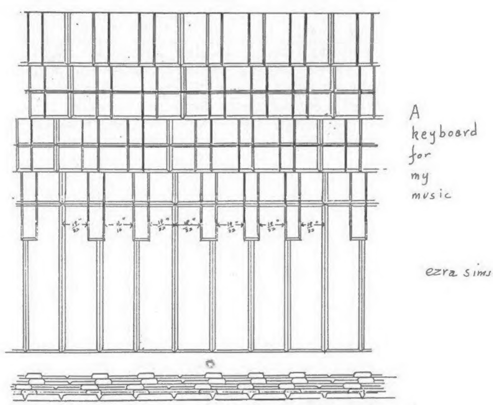
I would also hope, however, that even the first version could record in digital form what was played on it, for the preservation of improvisations -- after all: I might never be able to get up the money to build a fancier version.

As for the synthesizer, all the MIDI instruments that I've investigated have proven rather too coarse in their pitch, so I'm using David Rayna's proprietary synthesizer, run by his RTMP system, which is not MIDI. I assume the keyboard would use it, too, unless someone comes up with a way to get really fine tuning out of the commercial MIDI instruments.

If need were, I could do (if slowly) most of the cutting and forming. But planning for and implementing the electronics would be quite beyond me.

Could I ask you to print this letter in hopes of its finding someone among the readers of your magazine who might be interested in collaborating on realizing this instrument?

Ezra Sims
1168 Mass. Ave.
Cambridge, MA 02138



THE SIMS KEYBOARD -- This is a portion of the diagram enclosed with the Ezra Sims' letter.

THERE'S BEEN A REVIVAL OF INTEREST in Spike Jones over the past few years. Since the Jordan Young book [on Spike Jones, reviewed in EMI Vol IV #4] came out, a fine book by Jack Mirtle has been published and quite a bit of video material has become available. Much of this interest has been in the realms of nostalgia or popular fascination with the novelty and comedy records of the recent past. On another level, Spike Jones has had an impact on musical experimentation and improvising musicians over the past 10-15 years. While the City Slickers' music was not improvised (rather, carefully scored and choreographed, musically and visually, into arrangements that rarely varied over the decades of the band's existence), Jones' pursuit of the spirit of eruptive spontaneity has great appeal to performers who regard spontaneity (improvisation) as the highroad to musical discovery, unrestrained by conventional limits to instrumentation, style, form, etc. Has anyone so thoroughly explored, before or since, a wider range of human vocalization? Has anyone, before or since, scored such a triumph in cacophony as the concluding sections of "Morpheus" or "Rhapsody from Hunger(y)?" Interestingly, the music of the City Slickers parallels the acceleration of mayhem (again, visual and musical) in the animated cartoons of the 1940s, which have also offered much inspiration to modern improvisers. Certainly, animated cartoons offer an almost limitless catalog of the most outrageous experimental musical instruments.

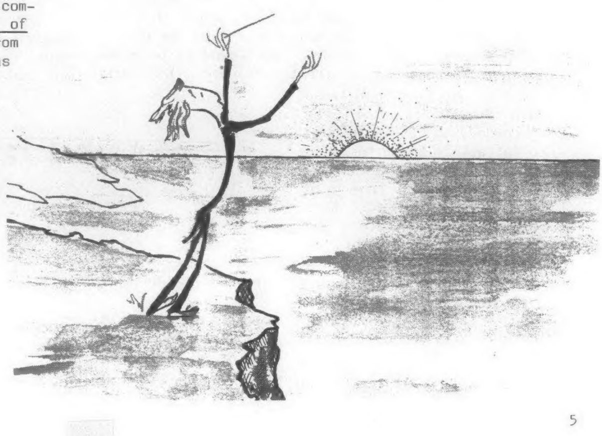
Anyway, as I said, there's a lot of Spike Jones' material that has become available lately. Jack Mirtle's Thank You Music Lovers (Greenwood Press, 88 Post Rd. West, PO Box 5007, Westport, CT 06881) is a bio-discography of incredible thoroughness. While Jordan Young's book presents a handy overview for the Spike Jones fan, Mirtle's is **the** book for the collector. (It's a bit expensive at $55 and has far fewer photos than Young's book). The Craziest Show on Earth [a 3-record set, also reviewed in EMI Vol IV #4] is still available and Publishers Central is probably the easiest place to get it. They also distribute a video compiled by Spike Jones Jr. called The Best of Spike Jones, Volume I. "Farrandole" from that 3-record set is included in here, as well as other fine instrumentals and crazy gags. There is already a Vol. II in this series (that I haven't seen) and a Volume III due early next year. Video Yesteryear (Box C, Sandy Hook, CT 06482) makes several of the TV shows available. Highly recommended is the City Slickers' first TV appearance in 1951. Unaccustomed to television production, the City Slickers review seems barely contained by the studio stage and there are many wonderful moments of great depreciation.

Hal Rammel

From the editor: Since writing the above letter Hal Rammel has sent along another bit of Spikeography: The Spike Jones International Fan Club publishes a quarterly "Spike Jones Musical Depreciation Newsletter," available for $10/year from 129 East Colorado Blvd., Suite 508, Munrovia, CA 91016. William Galvin, writing from Amsterdam, adds that two greatest hits LPs have been issued in Europe by Lotus, marketed by SAAR srl in Milan: "Around the World with Spike Jones," LOP 14084 (1984), and "Spike Jones and his City Slickers," LOP 14103 (1985).

Hal Rammel also sent along a copy of his article "Dandruff in the Longhair Music," from a collection entitled **Free Spirits: Annals of the Insurgent Imagination** (edited by Nancy Joyce Peters et al., published in 1982 by City Lights Books, 261 Columbus Ave., San Francisco, CA 94133). We reprint one paragraph here, to further elucidate Spike Jones' special approach to instrumentation:

"Jones assembled a remarkable assortment of equipment. He and the rest of the band were on an unending search for unusual instruments and new sounds. Each town on their coast-to-coast string of one-nighters offered old music stores, automobile parts shops, and junk yards to shop in. On occasion, they would run a Screwy Instruments Contest. When someone showed up to play "Humoresque" on a set of thirteen tuned Flit guns, Jones bought the guns and sent the musician on his way. Once when a young man appeared with an instrument that included a rubber hose, a locomotive whistle, and parts of an eggbeater, he won the contest that night but no one ever figured out how to play the contraption. Hundreds of workers at a Detroit Plymouth factory produced an Exhaustophone for a contest but on its first performance it blew out a wall of the theater."



I WANT TO THANK YOU for the last issue. As my major concerns are making conga drums and working with children as an artist-in-residence teaching instrument making, it felt as though you had me in mind when you put it together. Although I never have enough time in the shop to develop most of my own experimental ideas, I do derive a lot of inspiration in my work in the schools from those working on the fringes as it were. Kids are natural experimenters and I enjoy exposing them to something outside of the cultural norm established by commercial media.

Regarding the article on pedagogy, I thought all the ideas illustrated were good for upper elementary grades and some of them appropriate for younger children. I was disappointed when I read that Mr. Phillips did most of the actual building himself. I assume that he did so due to certain constraints that he could do little about and to meet his own criteria for a creative experience for the kids and I find no fault in that. However, based upon my own experience I want to state that given the necessary support, most children 10 and up can make all the instruments depicted.

For my teaching I have five tool sets equipped with hand drill, coping and fret saws, hammer, needle nose plier/nippers, screwdrivers, rasps, bench block, clamp, glue, sandpaper and ruler. The initial investment was significant, but I do enough of this work to justify it. By shopping around carefully I did it for about $60-70 per set. Students usually make instruments that are tunable and playable such as mbiras and string instruments (younger stick to percussion). I provide the basic design and prepare some of the materials. I am aware that this "kit" approach compromises the child's own creative involvement, so I first introduce them to a wild collection of found objects and instruments made from "junk and stuff" that widen their own perspectives, and I encourage them to discover sound possibilities on their own. Many do! In the ideal residency (rare) there is time for students to collect their own materials and work from their own designs.

It is important for them to gain confidence from the experience so I consider it of great importance that they produce an instrument on which they can play something they recognize as "real music." I offer below a design that I have found to be especially successful in these respects. The only special material that I use are the tuners. They are hardwood objects produced by a factory in Maine to be used as dart bodies. I buy seconds from them in quantity and make them available to educators who would like to do this on their own. It is possible to use screw eyes or tapered hardwood dowels, but they do not work as well and are less convenient.

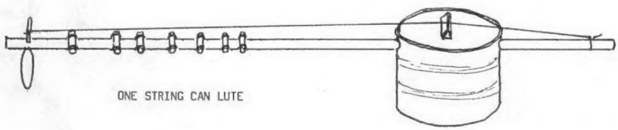
What distinguishes this design from others I have seen in various books on making simple instruments is the fret system. The "neck" of this instrument is a 5/8" dowel poked through the sides of a standard large food service can. Across this are placed sections of 5/16" dowel cut 1¼" in length. These are the frets and are held in place with short rubber bands, which I prefer to make by cutting a bicycle tire tube. The frets are placed by ear initially, and copied on to a gauge for the kids to use. They can be easily changed for alternate scales. I usually use monofilament fishing line for a string, but with a metal string and a bow it makes a pretty decent "rebab" and I have used it as such with gamelan instruments. I have students number the frets and present them the basics of playing technique plus a sheet of "music by numbers." In a two hour session I can get students through making their instrument and learning to play a couple simple tunes.

Another tidbit I have picked up along the way that might be of interest is a unique tuning system used on the Ethiopian Krar [diagram at right above.] I remained curious, but uninformed about this until I happened to meet and collaborate a bit with Seleshe Demessae, who makes and plays this instrument of his native country. Unlike other African tuning systems that rely on thongs, the addition of the stick makes fine tuning a little easier as you have the advantage of a little leverage. Its sheer simplicity appeals to me a lot.

Regarding drum making. I have found only one source of manufactured rawhide skins for drums in this country: United Rawhide Co., 1644 N. Ada St., Chicago, IL 60622. I would be interested in finding others if your readers know of any. The process of preparing your own skins is fairly simple but unpleasant and time consuming, so I avoid it. I did some serious looking once when this outfit was closed down for the summer, and came up bust.

Another bit of trivia. Water buffalo bladder is, according to Dennis Murphy, preferred in making the Indonesian rebab (didn't see it on your list). I have adapted Dennis' designs for the small gamelan that I use with my students. I am playing in the Plainfield Village Gamelan, which is sometimes touted as the oldest American-built gamelan (referring to the instruments which Dennis made). Incidentally, Dennis, being an "arch-vegetarian," uses only doped cloth for drumheads.

Methinks I am getting carried away here. I guess I just appreciate the thought that there are more than one or two people around for whom this is not just arcane to the point of ridiculous.

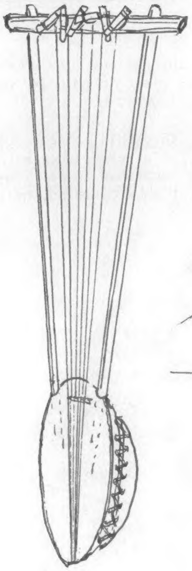


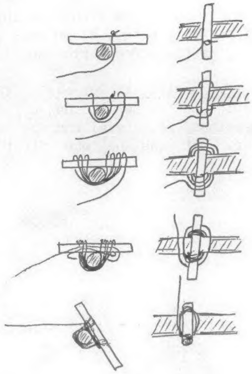
ONE STRING CAN LUTE

Looking forward to more from EMI -- my thanks to you.

Peter Fischer
280 Main
Montpelier, VT 05602

KRAR





The tuning mechanism

MORE ON FRETTED INSTRUMENT LIBERATION

EMI's April 1988 issue (Vol III #6) included several articles on refretting and related topics. They explored different approaches to the freeing of guitars and other fretted instruments from the sets of pitch relationships they are locked into by virtue of fret placement at the time of their manufacture.

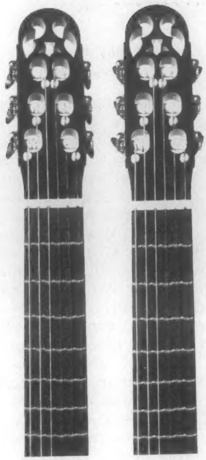
One of the builders very briefly mentioned in that article was the German guitar maker Walter J. Vogt. Since the time of that publication, EMI has received more complete information on his work. Here is a synopsis:

Walter Vogt has evolved a very precise movable fret system using small, curved fretlets designed to slide in inserts set into the neck. Rather than having single frets which cross the entire neck, each movable fretlet is just wide enough to sit under one string, making each semitone on each string independently tunable. The slight curvature is designed to compensate for increased tension arising from any lateral displacement during playing, by slightly increasing the vibrating length if the string bends to one side or the other. Vogt has also created a "compensating nut," by means of which the exact point at which the individual string passes over the nut (which defines the end of its vibrating length) can be fine-tuned.

The system can be used, within limits, to position the frets for unusual tunings not normally available on guitars. Vogt's primary purpose in designing it, however, was to make it possible to achieve a higher degree of accuracy in tuning to the standard twelve tone equal temperament.

Vogt began by performing a series of controlled intonation tests on guitars. He found a variety of factors contributing to irregularity of pitch at different frets, including peculiarities of individual strings and the nature of the individual player's touch. The changeable nature of these factors makes it impossible to find a single set of linear fret placements that will always serve (with the degree of precision the Vogt seeks). And so he set about creating his completely adjustable system, designed to make it possible to fine tune the frets to fit the individual characteristics of the player, the strings and the instrument.

Ideally, the frets are to be re-adjusted each time the guitar gets a new set of strings. According to Vogt's literature, the process of individually setting the 110 fretlets takes about a half hour, with the aid of an electronic tuner.



At left: ADJUSTABLE FRETBOARDS by Walter Vogt

EGGSHELL INSTRUMENTS

By Bart Hopkin, with lots of assistance from Robin Goodfellow

In recent issues **Experimental Musical Instruments** has been running a series of articles on instruments made from natural materials. Earlier installments have featured instruments of gourd, bamboo, and, more recently, animal horn, tusk, bone and shell. The series continues now with this article on the aerophonic possibilities of eggshell.

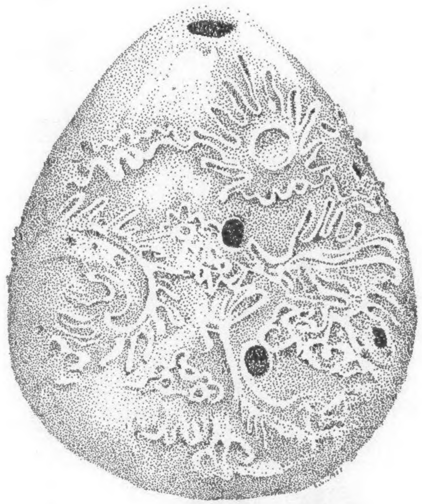
There is a traditional Chinese globular flute of clay, the name of which has been anglicized variously as hsun, hsuan and xun. It has been in existence since before 1700 BC and is still heard today. It has the lovely, round, spacious yet subdued tone that is characteristic of larger vessel flutes. It is blown with pursed lips over a circular blowhole at the top, and -- this is the part that interests us here -- it is, in its most common form, nearly perfectly egg shaped.[1]

Now, if a clay instrument of egg shape can produce a sound as lovely as does the hsun, then what are the possibilities for an actual egg shell?

To begin to answer that question, the first step is to obtain a shell. Chicken eggs, of course, are most readily available. Most people are familiar with the lung-powered procedure for emptying them of the yolk and white, using a pin or nail to poke a small hole in each end and forcing the contents out through one hole by forcing air in through the other. The smaller hole of the two holes in the emptied shell can then be covered (by sticky tape, putty, a finger or whatever), and the larger one roughed out to form a blowhole. This done, the eggshell is now a simple, monotone ocarina. Even with a crude, irregularly-shaped blowhole it will whistle, producing a breathy flute tone when you blow over it. The pitch will be determined by the volume of enclosed air and the size of the blowhole. By slightly enlarging the size of the blowhole the shell can be tuned (within limits). The pitch can also be adjusted quite a bit, especially with smaller eggs, by wind pressure and angle.

If you decide to work with goose eggs in place of chicken eggs, not only does the chamber become larger, but the shell itself will be a trifle thicker and stronger. Emu eggs are better still. By the time you get to ostrich eggs, with their beautifully dimpled surface, you have a shell of perhaps five inches in diameter, a little more in the long dimension -- that's as big as a large, low-pitched ocarina -- and as thick as fine china. With larger eggs the tone becomes richer, more refined, and more stable in intonation. The sound of an ostrich egg, blown over a single hole in the top, is truly deep, rich and lovely.

My mentor in preparing for this article was Robin Goodfellow, who has a lot of experience with ocarinas in general and egg ocarinas in particular. It was she who first showed me eggshell



HSUN, made of fired clay and highly decorated.

Drawing by Robin Goodfellow

instruments, and let me see how easy it is to produce the chicken egg whistle described above. Not surprisingly, she has taken the idea several steps further. By auditioning a very large number of chicken and smaller pullet eggs, Robin has created diatonic and chromatic tuned octave sets of single-note egg ocarinas. She has also created tuned sets by judiciously adding water to individual eggs, thus adjusting the size of the chamber and altering the pitch in a controllable way. For a single player, performing on such a set can be pretty wild: even in slow passages, the picking up and putting down of another egg for each note easily degenerates to a sort of crazy flailing. But they are a natural for hocketting. (Hocketting is the communal music making approach in which the pitches of a scale are alloted to different players, giving each indiviudal the means to produce only one or two notes. Melodies are created by moving from player to player). As

I see it, in a world of individualists gone mad, more hocketting could only do us good.

OK, time for the next step: how about making tone holes to increase the range of an egg from a single pitch to many?

When tone holes are added, the eggs suddenly become much less willing to speak. Someone with an excellent embouchure might be able to play an endblown chicken egg with finger holes, but I am able to produce a clear tone only with all finger-holes covered. Larger eggs are somewhat less crotchety in this respect, but the problem remains. When I added fingerholes to an ostrich egg, with my inexpert embouchure set just so I was able to produce identifiable pitches over a range of about a fifth. The tone was breathy and vague.

Most flutes will speak more readily with a well-adjusted fipple. (The fipple is a narrow windway of the sort found on recorders, which directs a fine stream of air over the sounding edge.) While the egg-shaped Chinese hsun is played directly by air from the lips, most other globular flutes employ fipples, and would be quite difficult to play without them.

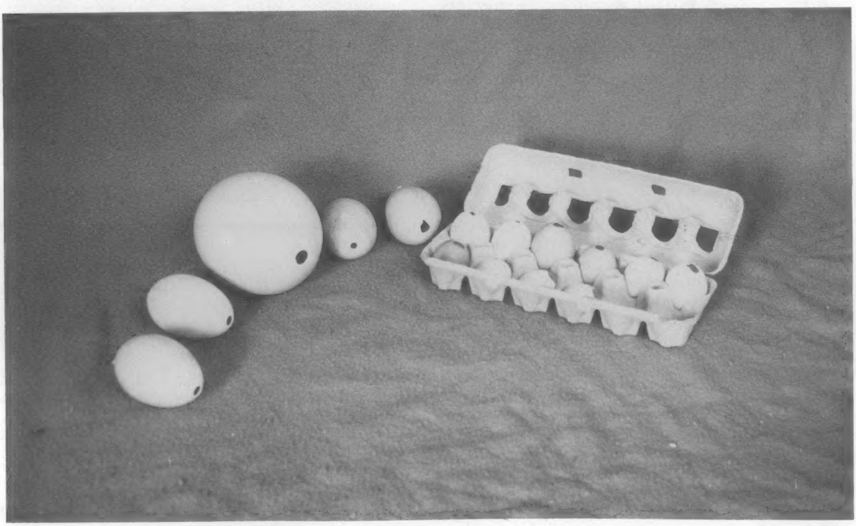
When it came to adding a fipple to a goose egg shell ocarina, I cheated: I used the ready-made fipple and sounding edge from a Song Flute, which is an inexpensive plastic recorder-like children's instrument made by Conn. This troubled Robin Goodfellow, who felt there was something inappropriate about joining a mass-produced piece of molded plastic to one of nature's finest creations. I did it anyway. I sliced off most of the Song Flute's barrel at an angle just below the sounding edge, and ground the resulting opening to a curve matching the surface of the egg. I enlarged and shaped the hole at the top of the egg to match the open end of the truncated song flute, and glued the two together with 5-minute epoxy, being sure to fill any potential leaks as I did so. To mitigate the aesthetic clash between plastic and eggshell I spray painted both a tasteful dappled blue.

The fipple did indeed enable the goose egg ocarina to speak with the use of toneholes. The finished instrument, with the somewhat arbitrary set of fingerholes I gave it, produces a diatonic minor scale over a range of a fifth, with pleasant, clear tones at very low wind pressure.

A good fipple, however, is custom designed for its air chamber, in order to optimize the chamber's performance. Though it made for substantial improvement, my appropriated plastic fipple was not designed for the goose egg it now serves, and it probably leaves us still well short of the eggshell's full musical potential.

To pursue this angle, I went back to my ostrich egg. Having been through my earlier experiments, this particular eggshell already had a number of superfluous holes in it. I was able to cover some with several layers of tape and proceed -- an inelegant, but reasonably effective solution. This time I used molded clay to make a fipple which could be affixed to the surface of the egg directly in front of the blow hole. (Thus, rather than adding a windway with its own sounding edge as had been done with the Song Flute section, I used the

A MUSICAL EGG ARRAY. In the carton, a diatonic set of chicken and pullet eggs. On the left, goose eggs and an ostrich egg.



edge of the blowhole in the egg itself, adding only the windway in clay.) The blowhole, meanwhile, was reshaped to give it a straight edge for the air to strike opposite the windway opening. In forming the clay fipple, I made a broad base and pressed it over the surface of the egg to create a matching contour, making for an ample gluing surface later on. Then, with the clay still wet, I worked with it, modifying the size and direction of the airstream over the blowhole, to achieve the best results in tone quality and range. (For testing purposes it is possible to blow through the wet clay without deforming it, if you are careful).

And what were the results? Proceeding this way, it proved possible to achieve the lovely, deep tone characteristic of a large globular flute, sounding clearly over a wide range, and produced effortlessly by the player. And though the particular ostrich egg that I was working with had had been through the wars by the time I was through, and my inexperienced clay work was crude and clumsy, the instrument has a visual simplicity and beauty and logic of form that arises naturally form the eggshell shape.

WORKING WITH EGGSHELL

Eggshells, especially the smaller ones, are notoriously fragile. But they are more workable with power tools than you might expect. They can be drilled (very carefully for smaller shells). Once drilled, holes can be gently enlarged and shaped using the drill and various shaping or grinding bits. Ostrich egg shells are wonderful in this regard, being strong enough to be worked with little fear of cracking, and thick enough even to be carved in fine relief on the surface.

It may be helpful, especially with smaller and more fragile eggs, to begin by varnishing them, which adds strength and looks nice too. Alternatively the shell can be layered over with heavier or more workable materials (as long as they are not substances, such as clay, which shrink as they dry).

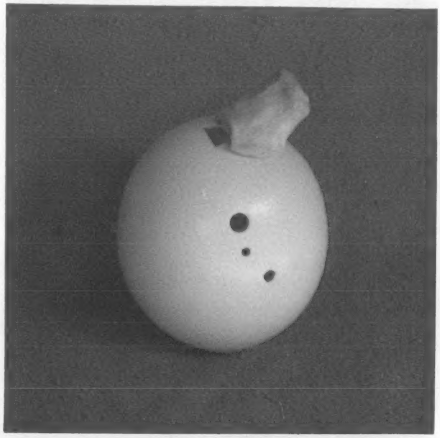
How do you decide on tone hole size and placement? This is a simpler matter for globular flutes than it is for tubular. That's because with globular flutes the effect of location is minimal: the key factor is size. Thus, tone hole locations can be chosen for ease of playing, and the tuning then adjusted by enlarging the holes as need be. For scales of an octave and sometimes more, fully diatonic and with varying degrees of chromatic completeness, there are standard ocarina fingering arrangements which have proven quite effective over the years. For a full discussion of fingerings and tone hole placement, see the article "Sharon Rowell's Clay Ocarinas" in **Experimental Musical Instruments** Volume I #2, August 1985.

Making effective fipples, whether in clay or other materials, is a more demanding art. A detailed discussion of this can also be found in the ocarina article mentioned above.

No one will have any difficulty locating sources of chicken eggs to work with, but other eggs may be hard to get hold of. Larger eggs can be found though, since several large species are commonly raised domestically, including turkey, peacock and goose. Some good starting points for locating eggs of a particular species might include calling the local agricultural extension or 4-H club, looking in the phonebook under poultry dealers, or calling the local zoo. Some art supply stores or hobby shops carry blown goose egg shells.

Boone Trading Company (562 Coyote Rd., Brinnon, WA, 98320) stocks all kinds of exotic and hard-to-find things, including blown ostrich egg shells. Catalog available.

OSTRICH EGG OCARINA:
A beautiful sound dispite the crudeness of the fipple.



THE SOUND SPECTRUM

On the following pages is a frequency chart. It gives staff notation, pitch name, frequency and wavelength in centimeters for sound waves within the human hearing range, and highlights some landmarks along the way.

Stated more abstractly, this chart takes the continuum of audible pitches and segments it in a manner corresponding to western musical practice. In mapping what would otherwise be an undifferentiated continuum, we have had to make use of a number of conventions, some of which are discussed in the following paragraphs.

PITCH NAMES

There has long been substantial agreement in western practice as to how to name the pitches within the octave. But distinguishing between like-named pitches in different octaves remains confusing. How do you indicate whether the Bb you are referring to is the Bb below the Bb below middle C, or the one below that? Quite a few systems have been used to give each pitch a unique label. The one given in the left hand column of this chart, using all capital letters with subscripts to denote octaves, has become the most commonly used by acousticians, and has been accepted by the American Standards Association. The Helmholtz system appearing in the adjacent column appears in widely used musical sources such as Grove's Dictionary, despite its awkwardness.

PITCH STANDARDS

The frequency of the A above middle C is normally used as a benchmark for fixing musical pitches to a standard. Over the centuries in western practice the frequency of that A has ranged from below 400Hz to 455 and higher. The International Organization for Standardization has set the modern pitch standard at A=440Hz (1955; reaffirmed in 1975). That standard has been widely accepted, and this chart is predicated upon it.

JUST VS. TEMPERED TUNINGS

This chart presents frequencies for 12-tone equal temperament at A=440, despite calls from many thoughtful musicians to lessen this system's musical dominance. The reason is that the just systems in use are too diverse to allow for standardized presentation.

The figures for 12-tone equal temperament given here are mathematically ideal; it should be remembered that in practice piano tuners often "stretch" the octaves, deliberately tuning sharper than the ideal as they ascend.

CALCULATING FREQUENCIES & WAVELENGTHS FOR PITCHES NOT GIVEN

12 tone equal temperament divides the octave into 12 equal divisions (in accordance with the generally accepted definition of "equal": pairs of pitches are considered to be equally spaced if the pairs' frequency ratios are equal). For reasons of space, this chart gives only the seven pitches per octave of the C major scale. To find the frequencies of the intervening pitches in 12-equal, multiply the frequency of the pitch a semitone below the missing pitch by the 12th root of two, which is 1.0594613. Repeated application of this constant can also be used to build twelve tone equal tempered scales based on pitch standards other than A=440.

To find the frequencies for non-twelve equal tempered scales, find the multiplier constant for the desired number of divisions per octave. For **n** divisions per octave, that constant will be the nth root of 2. Starting with a chosen base frequency representing the lowest pitch of the desired scale, multiply by the constant to get the frequency for the next scale degree. Apply the constant again to each successive frequency to build the scale. The **n**th application should yield double the starting frequency, which is the pitch an octave higher, completing one octave of **n**-tone equal temperament.

Practitioners of just intonation will be interested in the frequencies of un-tempered pitches not given here. To find them they will begin with the frequency of a chosen starting pitch (perhaps one of those on the chart), and multiply it by the appropriate ratios of the desired just system.

Wavelength is inversely proportional to frequency. Once the frequency is known, the wavelength for any pitch can be found by applying the formula: Wavelength = **c**/**f**, where **f** is the frequency and **c** is the speed of sound. For this chart the constant used for the speed of sound was 343.5 meters per second. The actual speed in air varies slightly with temperature; the above figure corresponds to a temperature of 20 degrees centigrade, or about 68 degrees Fahrenheit.

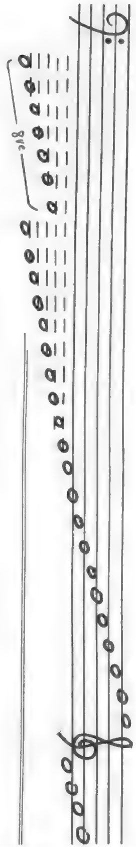
THE CENTS SYSTEM

One of the primary methods for precise measurement of musical intervals is based upon a unit called the "cent", defined as 1/100th of a semitone in 12 tone equal temperament. The octave thus comprises 1200 cents. The cents system measures relative rather than absolute pitch. This chart provides information relating to absolute pitch, so cents values do not appear.

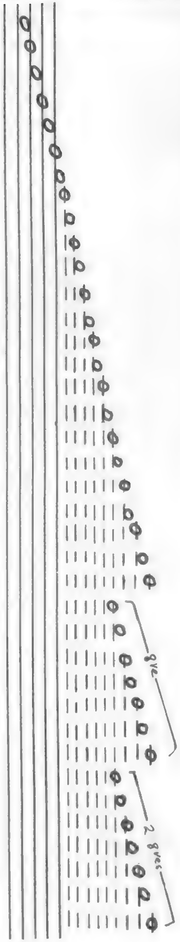
(Sound chart notes continued on page 14)

FREQUENCY, PITCH & WAVELENGTH

In 12-tone Equal Temperament at A = 440



Pitch Name (ASA)	Pitch Name (Helm.)	Frequency	Wave Length (cm)		
C_0	C"	16.351	2100.1	C_0: Bottom of the organ's 32' octave; lowest definite pitch on any standard instrument.	
D_0	D"	18.354	1871.5		
E_0	E"	20.601	1667.4		20Hz: Approximate bottom of hearing range for one with good hearing.
F_0	F"	21.827	1573.7		
G_0	G"	24.499	1402.1		
A_0	A"	27.500	1249.1	A_0: Piano's lowest note.	
B_0	B"	30.868	1112.8		
C_1	C'	32.703	1050.4	Bottom of organ's 16' ranks	Here in the very low part of the hearing range the ear's ability to identify definite pitches diminishes.
D_1	D'	36.708	935.8		
E_1	E'	41.203	833.7	String bass low E	
F_1	F'	43.654	786.9		
G_1	G'	48.999	701.03		
A_1	A'	55.0	624.5		60Hz: American standard for AC power transmission. Resulting transformer hum is normally double that, making 120Hz possibly the most commonly heard frequency in modern American life.
B_1	B'	61.735	556.4		
C_2	C	65.406	525.2	Bottom of organ's 8' ranks	75Hz: Approximate low end roll-off frequency area for typical medium-quality livingroom stereo system. Pitches below this may be surmised more than they are actually heard.
D_2	D	73.416	467.9		
E_2	E	82.407	416.8	Guitar low E	
F_2	F	87.307	393.4		
G_2	G	97.999	350.5		
A_2	A	110.0	312.3		
B_2	B	123.47	278.2		100Hz: Typical upper limit of affected frequency range for amplifier bass tone control.
C_3	c	130.81	262.6	Bottom of organ's 4' ranks	
D_3	d	146.83	233.9		
E_3	e	164.81	208.4		
F_3	f	174.61	196.7		
G_3	g	196.00	175.3	Approximate fundamental frequency range for typical male voice.	
A_3	a	220.00	156.1		
B_3	b	246.94	139.1		
C_4	c'	261.63	131.3	Middle C	
D_4	d'	293.66	117.0		
E_4	e'	329.63	104.2		
F_4	f'	349.23	98.4		
G_4	g'	391.99	87.6		



A_4	a'	440.0	73.1	A-440
B_4	b'	493.88	69.6	Approximate fundamental frequency range for typical female voice
C_5	c''	523.25	65.6	Bottom of organ's 1' ranks
D_5	d''	587.33	58.5	
E_5	e''	659.26	52.1	
F_5	f''	698.46	49.3	
G_5	g''	783.99	43.8	
A_5	a''	880.0	39.0	
B_5	b''	987.77	34.8	
C_6	c'''	1046.5	32.8	C_6: Highest note normally written for trumpet.
D_6	d'''	1174.7	29.2	
E_6	e'''	1318.5	26.1	
F_6	f'''	1396.9	24.6	
G_6	g'''	1568.0	21.9	
A_6	a'''	1760.0	19.5	Bb_6: Bb soprano clarinet's highest note.
B_6	b'''	1975.5	17.4	
C_7	c''''	2093.0	16.4	
D_7	d''''	2349.3	14.6	
E_7	e''''	2637.0	13.0	
F_7	f''''	2793.8	12.3	
G_7	g''''	3136.0	11.0	
A_7	a''''	3520.0	9.8	
B_7	b''''	3951.1	8.7	
C_8	c'''''	4186.0	8.2	C_8: Piano's top note D_8: Piccolo's top note
D_8	d'''''	4698.6	7.3	Up here in the high part of the hearing range the ear's ability to identify definite pitches diminishes.
E_8	e'''''	5274.0	6.5	
F_8	f'''''	5587.7	6.1	
G_8	g'''''	6271.9	5.5	Typical frequency range of triangle; drummer's brushes would be a trifle higher.
A_8	a'''''	7040.0	4.9	
B_8	b'''''	7902.1	4.3	
C_9	c''''''	8372.0	4.1	10,000Hz: Typical lower limit of affected frequency range for amplifier treble tone control.
D_9	d''''''	9397.3	3.7	
E_9	e''''''	10548	3.3	
F_9	f''''''	11175	3.1	
G_9	g''''''	12544	2.7	
A_9	a''''''	14080	2.4	
B_9	b''''''	15804	2.2	
C_{10}	c'''''''	16744	2.1	16,000Hz: Approximate high end roll-off frequency area for typical medium-quality livingroom stereo system. Higher frequencies may be lost.

20,000Hz: Approximate top of hearing range for one with good hearing.

Continued from page 11

FUNDAMENTAL FREQUENCIES VS. ACTUAL FREQUENCY SPECTRA IN MUSICAL SOUNDS

We can define a particular musical note as having a particular frequency. However, it does not follow from this that a musical instrument playing that note will produce that frequency alone. Most instruments produce a fundamental frequency which the ear hears as **the** pitch, plus a number of additional frequencies which are harmonically related to the fundamental, plus some admixture of nonharmonic frequencies and an added complement of irregular or transient noise. Where instrument ranges and such are referred to on this chart, the reference is to fundamental frequency ranges. While it might have seemed interesting to include as well the full spectral ranges of some sample instruments, it turns out that in all but a few cases the spectra are so wide as to cover most of the hearing range, making for an awfully crowded chart. The same is true of environmental noises that might have been included -- footsteps, ambient room sound, or the ocean's roar, for instance.

WAVELENGTHS AND WIND INSTRUMENT TUBE LENGTHS

One of the applications of wavelength data is in the creation of tubular wind instruments and tuned air resonators. It is difficult to precisely and accurately predict the pitch of an enclosed air column based on wave length calculations, because various extraneous factors affect the results. But the following information will help at least in generating useful approximations which can later be fine tuned.

Half- and quarter-wave resonators:

When an enclosed air column is excited into vibration in its fundamental mode, the entire waveform is not normally contained in the tube.

If the tube is cylindrical, closed at one end and open at the other, as with a stopped organ pipe, then one fourth of the wave (in the theoretical ideal) is enclosed, and the wavelength is four times the tube length. The same is true of cylindrical bores open at one end and with a pulsating air gateway (single or double reed; buzzing lips) at the other.

If the tube is cylindrical and open at both ends -- as with a flute -- or conical and having a reed at one end -- as with oboe and sax -- it encloses one half the waveform in the fundamental mode; the wavelength is twice the tube length.

The open end correction factor:

The size of the opening at the end of the tube throws off the correspondence between tube length and wave length and affects the resulting pitch. If the tube simply ends with no flare, the effective tube length will be the actual tube length plus 0.61**r**, where **r** is the tube radius. If there is a bell at the end, calculating the effective length is more difficult to predict with precision, but will typically extend to a point somewhere within the bell.

INSTRUMENTS

SHAPE AND FORM, CONTEMPORARY STRINGS

Part I: Fred Carlson, Francis Kosheleff, Susan Norris & Clif Wayland

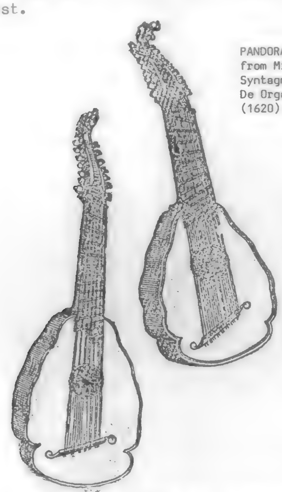
Notes by Bart Hopkin and
the builders whose work appears.

This is the first of a two-part presentation. Unusual string instruments by several more artisans will appear in EMI's coming issue.

Continued from page 1

them into a soundboard covering an enclosed resonating chamber. This has proven to be an effective system, and, Stradivarian mystique aside, a fairly flexible and forgiving one. That is to say, as long as some basic criteria are met, it will work reasonably well in a wide variety of circumstances, including any number of diverse chamber shapes.

This is illustrated by the fact that in past centuries, European string instruments appeared in an amazing variety of configurations. Some, like the early pandoras and orpharions, or some of the later lyre-guitars and harp-guitars, were really quite fanciful, quite extravagant in form. Among the standard instruments in use today, the assortment is more limited; still, from circular banjos to scalloped violins, many elegant contours persist.



PANDORA & ORPHARION, from Michael Praetorius' Syntagma Musicum, De Organographia (1620).

Two opposing forces are at play in the evolution of instrument shapes. On one hand, they have a tendency to standardize themselves: certain forms are found to be especially effective acoustically, or practical in other respects. Makers naturally return to these, and gradually refine them. Once a form becomes established, a repertoire and a pool of skilled players develop around it, and soon the great agent of cultural continuity, tradition, weighs in.

On the other hand, people are tinkerers. They won't be stopped from trying something new or searching for something better. Given an infinity of possible shapes and the inherent workability of the acoustic system in question, there is always room to explore.

Standardization may sometimes seem to have gained the upper hand. But in truth there are many builders creating string instruments today in unexpected shapes and forms. The following pages, along with the follow-up in EMI's next issue, should provide ample evidence.

SUSAN NORRIS & FRED CARLSON, whose instruments appear overleaf, live and work in Vermont. Over the years they have built, individually and together, a wide variety of plucked and bowed string instruments, both conventional and otherwise. In their recent work they have made extensive use of sympathetic strings (unplayed strings which enrich the sound of an instrument by vibrating in sympathy with the played strings). The sympathetic strings often cross sitar-like, wide, flat bridges, imparting varying degrees and qualities of buzz to the sound. The Norris/Carlson instruments also often have asymmetrical body shapes "that dance" (Susan's words) and "that look almost alive, in the process of both melting and dancing, and about to take off into outer space" (Fred's words). Susan's training is primarily in violin making. Fred's background is mostly in making plucked strings, and he pays special credit to one of his early mentors, Ken Riportella.

For more information on instruments by Susan Norris and Fred Carlson, contact them at RD #1 Box 2250, Plainfield, VT 05667. They will be happy to correspond on related matters, and they do build instruments on commission.

Overleaf, left to right:
SYMPITAR, SUZALYNE, and CELLITAR.

Fred Carlson's SYMPITAR is a steel string guitar with eleven sympathetic strings running inside the neck (in a hollow graphite-laminate reinforcing channel) and over a sitar-like bridge on the underside of the top. The materials are Engelmann spruce for the top, bubinga (a rosewood) on the back & sides, walnut for the neck, Schaller tuners, abalone inlay, and sitka spruce bracing. ("Bracing" refers to strips of wood glued to the

underside of guitar tops for reinforcement and distribution of the vibration.) An unusual bracing pattern is used to accommodate the sympathetic strings and to make the most of the unusual soundboard shape. The back of the instrument, not visible here, is deeply arched.

The SUZALYNE, built by Susan Norris, has five bowed strings encompassing the range of the violin and viola, and eleven sympathetic strings. The sympathetic strings run from pegs in a two-tiered scroll, under the fingerboard and over the top. They pass over a wide and slightly curved sitar-like bridge covered with abalone shell, and between the feet of the other bridge, where they

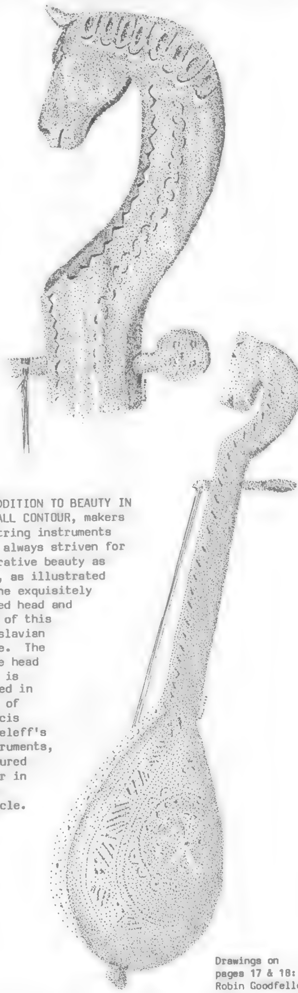
SYMPITAR,
SUZALYNE,
& CELLITAR

each attach to a fine tuning mechanism on the tailpiece. The top, bass-bar and sound post are sitka spruce, and the back, ribs, neck, scroll and fingerboard are curly maple. You can't tell here, but the finish (Suzy's own home-made varnish) is a gorgeous, mysterious deep watery blue.

The CELLITAR was built by Susan Norris and Fred Carlson, with the help of the customer who commissioned it. It is basically a plucked cello with an extra high string. You could also think of it as a five-string arch-top guitar tuned in 5ths. It has nine sympathetic strings that run beneath the fretboard but over the soundboard, over a wide ebony bridge, between the legs of the other bridge, and attach to pins on the tailpiece. The tailpiece is brass, with a carved wooden cover. The arched top is carved out of western red cedar. The back and sides are mansonia. As with the Sympitar, there is a mechanism for damping the sympathetic strings when one prefers them silent.

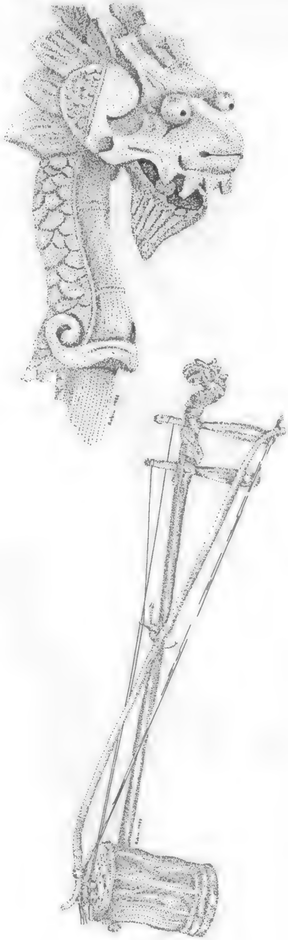
Below: DETAIL OF THE SYMPITAR TOP.

The little brass pins visible in the middle of the sympitar's bridge below the saddle are where the sympathetic strings attach. The strings run from there into the inside of the instrument, through tiny holes in the bridge. They can be seen passing below the sound hole area heading up toward the neck. The little black button on the upper left side of the sound hole is a lever for damping the sympathetic strings. The very simple mechanism pushes a small fabric-covered arm up against the sympathetic strings to stop them from sounding. The top is stained lightly with rubbed in blues and reds, to create a dreamy, cloudy, sunrise sort of look.



IN ADDITION TO BEAUTY IN OVERALL CONTOUR, makers of string instruments have always striven for decorative beauty as well, as illustrated by the exquisitely carved head and back of this Yugoslavian gusle. The horse head here is echoed in some of Francis Kosheleff's instruments, featured later in this article.

Drawings on pages 17 & 18: Robin Goodfellow



MORE STRING INSTRUMENT DECORATION: This finely carved Chinese dragon head is from a snake skin Er Hu some might remember from an earlier appearance in EMI.

CLIF WAYLAND is an instrument builder living and working in Daly City, California. His traditional emphasis has been on hammer dulcimers and Appalachian dulcimers. In recent years he has built a number of plucked and bowed string instruments derived from but distinctly differing from diverse existing types. His work reflects an aesthetic emphasis on simplicity of line and balance of form, and a corresponding avoidance of overdecoration and elaboration.

For more information on Clif Wayland's instruments, contact him at 5 Fairview, Daly City, CA 94015.

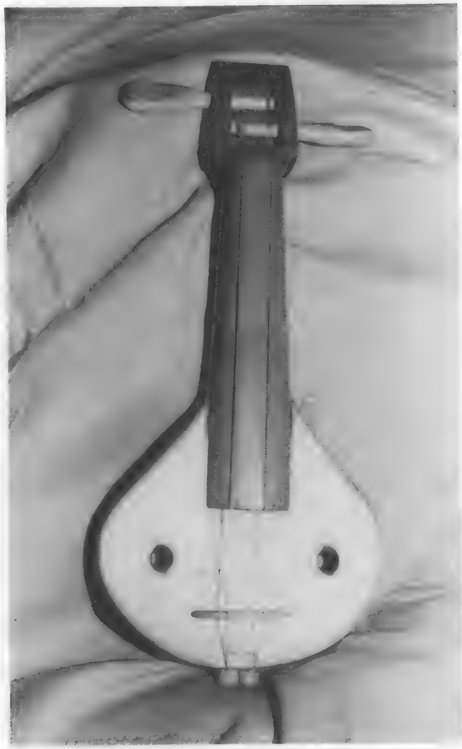
Below: LYRE.

Below left (Facing page): LYRE.

The front of the Clif's lyre is hand carved mahogany, exquisitely finished. The sides and back are carved from a single piece of poplar, and the turned rosette is cherry. The movable bridge pieces are ebony.

At right: REBEC.

Clif's rebec, like its medieval ancestors, is played with a bow. The body is a single piece of hand-carved poplar; the top is spruce. The pegs and fingerboard are maple.



At left: LONG NECK FIDDLE.

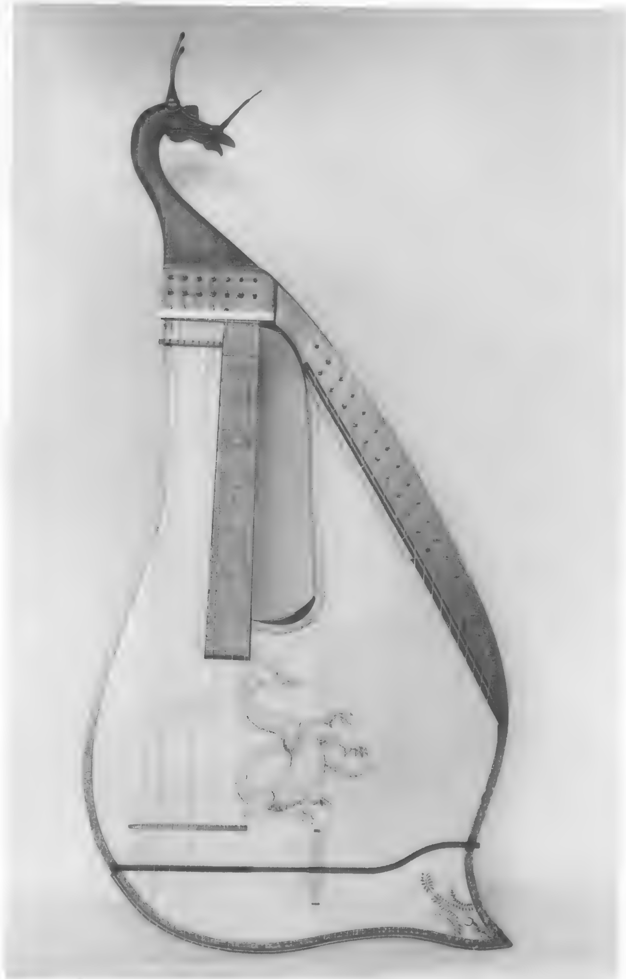
With its relatively long strings this instrument can be plucked as well as bowed (as a plucked instrument it resembles some of the early fretless banjos). The resonator is a coffee can bottom, hot-hammered (using a torch and ball-peen hammer). The body and neck are mahogany, and the fingerboard maple.

FRANCIS KOSHELEFF lives and works in Los Gatos, California. For over twenty years he has built string instruments in an amazing variety of forms. Prominent in his work are instruments based on Russian types, notably balalaikas and banduras. His Packaxes -- guitars with folding necks for travel -- appeared in EMI's feature on travel instruments last February (Vol. III #5), and he has made folding balalaikas as well. He has built instruments inspired by (but not literally imitating) Indian and Japanese types as well.

For more information on instruments built by Francis Kosheleff, contact him at PO Box 634, Los Gatos, CA, 95031.

Facing page, below: DREAM INSTRUMENTS.

These were the first and second instruments that Francis made, built around 1965. They are based on forms that he saw repeatedly in dreams. The soundboards are Philippine mahogany ply (which can be effective on larger instruments such as these; it leaves something to be desired in smaller soundboards). The rosettes are drilled, carved and painted.



At right: BANDURA.

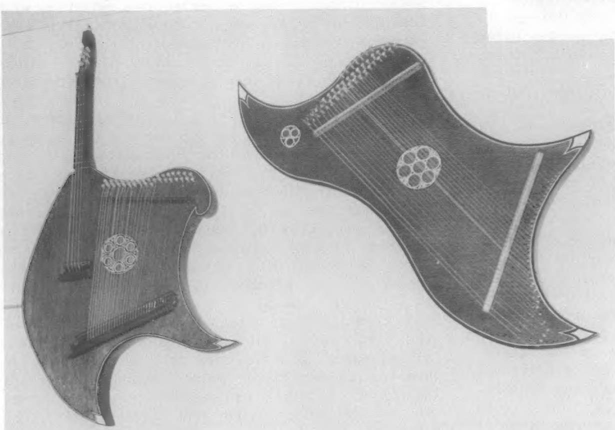
This is one of many bandura-like instruments from Francis' shop. The soundboard is spruce; the fingerboard rosewood; the pinblock rosewood with maple beneath; the sides and back mahogany ply, and the carved head teak. The decorative embellishments are created by woodburning.

On a similar bandura, as well as some other instruments, Francis has experimented with spring-supported soundboards. The soundboards are thin and use minimal bracing, but are reinforced by springs under the bridge positioned similarly to a violin soundpost. On the other instruments with this extraordinary arrangement, the effect was to make the instrument, whatever its original identity, sound like a banjo. But on the experimental bandura the effect proved to be quite agreeable, lending a unique timbre and increased sustain.

Above: PYRAMIDULCIMER.

In its original conception the four sides of this instrument were all to be strung. It was mounted on a swivel base to allow a single player to shift easily from playing on one side to another; alternatively, several musicians could have played the four sides simultaneously. There were soundholes not in the sides but in the bottom. The decorative motifs seen in the picture were photographs, laminated and varnished over. The height was about three feet. The pyramidulcimer played no role in the famous National Geographic computer-enhanced Egyptian cover photo scandal of a few years ago.

A fatal accident befell the instrument after this photo was taken. This was before all four sides had been strung, but after a one-sided inaugural public performance.



Above: HARP GUITAR.

This instrument, built around 1974, was inspired by an old harp guitar which came into the Kosheleff shop for restoration. The decorative designs on the soundboard are burned in. The back (not shown) is a patchwork of a half dozen exotic hardwoods, with photographs of diverse sculptural works laminated on and varnished over.

Books

ECHO: THE IMAGES OF SOUND
Paul Panhuysen, editor

Published in 1987 by Het Apollohuis, Tongelresestraat 81 5613 DB Eindhoven, The Netherlands

Reviewed by Bart Hopkin

Het Apollohuis is a center for musical and artistic exploration in Eindhoven. Between November 1984 and January 1985, Het Apollohuis sponsored the Echo Festival, bringing together in one place a selection of artists from Europe and the U.S. working at the border between music and visual art. The festival included concerts and installations in three cities, and served as a meeting of minds as well. From the festival also comes this book, written in English.

But the book **Echo: The Images of Sound** should be seen separately and in its own right, for it is not limited to information on the Echo festival. Editor Paul Panhuysen has taken the opportunity to make a wide-ranging book on diverse topics in the field of contemporary sound/art, bringing together the writings of diverse people in the field, not all of whom took part in the festival. Printed with support from the Dutch Ministry of Culture, the book is well produced, at 144 pages paper bound, nicely printed and with many clear and informative black and white photographs.

About twenty musicians and artists (listed below) took part in the Echo Festival. Many of them presented work using electronics, frequently based on inexpensive or low-tech gadgetry used in odd ways; others worked primarily with acoustic materials, in most cases bolstered with electric amplification; some others worked with the application of music-like organizational principles to areas outside the normal realms of musical sound. For each of these artists or groups of artists the book presents several pages, of text and photos. To mention a few:

Hans-Karsten Raecke is a builder primarily of wind instruments. While the description of his instruments is minimal, the **Echo** book contains photographs of about fifteen beautiful and very strange looking instruments, most of them apparently single reeds.

Jon Rose is a violinist who subjects the instruments of the violin family to various forms of alteration, often reflecting an adversarial relationship between performer and instrument in a manner that purists might find offensive. Here we see, among other things, photos of a cello with lots of awkward-looking extra strings and attachments which seriously undermine the traditional visual aesthetics of the instrument; and an Automatic Windmill Violin somehow held aloft (suspended from power lines?) with a set of windmill blades apparently striking the strings not very gently.

Richard Lerman's best known piece is his "Travel On Gamelan," which uses amplified plucked bicycle spokes. One version of the piece is performed by a troupe of cyclists on the move; a concert version is performed in a positive manner by standing three bicycles upside down on their handlebars and following a score. Part of that score is included in the **Echo** book. Lerman's section of the book also describes his micro-acoustic explorations, in which he seeks interesting sounds in paper money, aluminum foil, shopping bags and such. Sometimes the chosen materials are set up to operate like microphone diaphragms in response to vibrations the air.

Horst Rickels, Rik van Iersel and Joop van Braken are three builder/musician/artists who came together at Apollohuis to create a piece called "The Simulated Wood," a sort of non-sequential, story-like, simultaneously independent collaboration. To describe the work of just one of these three: Horst Rickels makes wind instruments, including the Organum Instabilium. This is an organ in which the wind pressure is deliberately allowed to fluctuate, creating varying timbral qualities and bending pitches.

Some of the artists represented in **Echo** submitted essays which range far beyond description of their own work. Most notable is "My Work as an Instrument Maker," by Godfried-Willem Raes. Godfried Willem Raes works through the Logos Foundation in Ghent. His writings are regularly accessible through **Logos-blad**, the newsletter put out by the foundation. Most of those writings are in Dutch however, and for linguistically limited types like myself the English essay included here in the Apollohuis book is very welcome.

Under the guise of an account of his past instrument making activities, "My work as an instrument maker" is a challenging essay by an original mind, remarkable in its ability to see beyond barriers that may arise in connection with too-familiar modes of thought. More than once Raes turns some intellectual corner to arrive at a disquietingly radical perspective -- but radical only in that it is very different from accustomed patterns.

Particularly interesting is his discussion of the limited nature of our approach to the analysis of waveforms, which in turn is analogous to and applicable to our systems for generating or reproducing sound electronically. The key phrase in his discussion is "one dimensional." We operate on the assumption that sound can be interpreted as patterns of oscillation of a single point moving back and forth in a linear fashion, as in the movement of an electron in a wire that conducts the electric analog of an acoustic signal. But this constitutes an impoverished representation of the event: sound vibrations occupy multi-dimensional space, and they are multi-directional. In Raes' words, electronic sound reproduction methods represent at best a caricature of natural sound. It is a caricature which none the less Raes finds interesting and useful, and so he continues to work with it.

Raes also is very concerned with the role that music plays in Western society, and in particular its tendency to reinforce an essentially divisive system. He always tries, as a result, to undermine virtuosity cults and existing professional/layman divisions. He works also to "demystify" (his word) musical electronics and similar implements and power systems by which divisive structures are intentionally or unintentionally perpetuated.

It should be mentioned here too that Raes has built some of the most interesting, original and challenging sound instruments you'll ever see or hear, and several of them are discussed in the course of the essay.

In addition to all this, **Echo** contains important contributions from Hugh Davies. Davies is the author of most of the articles on 20th century instruments in the **New Grove Dictionary of Musical Instruments**, a regular contributor to EMI, and, to the best of my knowledge, the most informed person around on the general subject of new instruments.

"A Survey of New Instruments and Sound Sculpture," written especially for the **Echo** book, is his broad overview. It begins with some history going back to the turn of the century, and then proceeds with a look at the current situation, emphasizing certain trends and schools of thought along the way. Davies uses an abbreviated writing style which allows for inclusion of a great many builders and instruments, with relatively brief information on each one. The essay would serve well as a guide for one who could then turn to other sources for more complete information on particular builders. Specifically, it makes a good a road map for Davies' own entries in the **New Grove Dictionary** mentioned above.

Davies also assembled for this book a discography and a selected bibliography of new instruments. Included are a number of sources that have not appeared in the books and records listings that EMI has published in the past, especially in connection with European sources.

The 1984-85 Echo Festival was followed by Echo Festival II, May-June 1987. A book documenting that second festival is scheduled to appear in Fall of 1989. For full information contact the publisher.

The artists taking part in Echo I were:

Paul Panhuysen, Hugh Davies, Julius, Ellen Fullman, Max Eastley, Takehisa Kosugi, Godfried-Willem Raes, Anton van Gemert and members of the Studio for Electro Instrumental Music, Horst Rickels, Rik van Iersel, Joop van Brakel, Bart Lootsma, David Mosconi, Giorgio Batistelli, Walter Marchetti, Juan Hidalgo, Giancarlo Cardini, Arnold Dreyblatt, Richard Lerman, Leon van Noorden, Johan Goedhart, Hans Karsten Raecke, Jon Rose, and George Smits.

NOTICES

NEW MUSIC WITH BIRDS, FROGS, AND OTHER CREATURES, a concert presenting music incorporating nature sounds by 13 20th century composers, will take place at the Oakland Museum, 1000 Oak St., Oakland, CA, on Sunday March 12, 3 PM, admission $5.

JUST INTONATION CALCULATOR, by Robert Rich. Macintosh hypercard stack makes JI easy: shows scales to 48 notes/octave; calculates transpositions; reduces fractions; converts between ratios, cents, DX7II, TX81Z units; internal sound. Only $10. Soundscape Productions, Box 8891, Stanford, CA 94309.

PERSONAL ETHNIC: a new 60 minute cassette of the music & flutes of Susan Rawcliffe with Alex Cline. Send $6.50 + 1.50 shipping & handling to Susan Rawcliffe, 2278 Allesandro, Los Angeles, CA 90039.

CRITTERS is a new cassette of music played by Tom Nunn on original instruments including Crustacean and Blossom (space plates, using struck and bowed bronze rods on stainless steel resonators), and the Bug (an electroacoustic percussion board). $8.00 plus sales tax in California, from Tom Nunn, 3016 25th St., San Francisco, CA 94946.

EMI BACK ISSUES: Back issues of Experimental Musical Instruments numbered Volume III #1 and later are individually available for $3.50 apiece. Earlier issues available in volume sets, photocopied and bound: Vol. I #1-6, $14; and Vol. II #1-6, also $14. Order from EMI, PO Box 784, Nicasio, Ca 94946, or write for complete listing. Corresponding cassette tapes also available for each volume; see information below.

CASSETTE TAPES FROM EMI: From the Pages of Experimental Musical Instruments, Volumes I, II and III are available from EMI at $6 apiece for subscribers; $8.50 for non-subscribers. Each tape contains music of instruments that appeared in the newsletter during the corresponding volume year, comprising a full measure of odd, provocative, funny and beautiful music. Order form EMI, PO Box 784, Nicasio, CA 94946.

RECENT ARTICLES IN OTHER PERIODICALS

Listed below are selected articles relating to unusual musical instruments which have appeared recently in other publications.

CONSTRUCTING THE AMADINDA XYLOPHONE by Robert Chappell, in Music for People, Winter 1988 (Rd 4, Box 221A, Keene, NH 03431).

Instructions for building a large rope-supported marimba, named after and loosely modeled after an Ugandan type. Various people and groups on this side of the Atlantic have built these things and found them to be wonderful in communal music situations.

THE SOUNDPOST OF THE VIOLIN by Louis Condax, in Journal of the Catgut Acoustic Society, Vol I #2 (Series II) (112 Essex Ave., Montclair, NJ 07042).

A description of an altered shape for violin soundposts. After a lot of experimentation, the author has arrived at a particular contour for the soundpost which, he believes, does the job of support and vibration conduction, but at the same time allows the violin freer response by its greater flexibility.

CROSSING THE BRIDGE by Hans Reichel, in Guitar Player, Volume 23 #1, Jan. 1989 (20085 Stevens Creek, Cupertino, CA 95014).

Hans Reichel's Dachsophone, a bowed wooden idiophone, was discussed in EMI Vol. IV #3. In this Guitar Player article he concentrates on his abnormal guitars. Among these are pick-behind-the-bridge guitars. Their strings extend well beyond the bridge and can be plucked on the "wrong" side. This results in vibrations being selectively transmitted across the bridge to the adjoining string length on the other side, where they are picked up by the pickup, for a most extraordinary sound.

Also in the January issue of Guitar Player, in John Sievert's "Questions" column: A brief description of the Gizmotron. The Gizmotron was an "electromechanical bowing device" for guitarists, invented and marketed briefly by rock guitarist Lol Creme around 1979. It was mounted over the strings and had six small rotating elements which contacted the strings when keys on the top of the unit were depressed.

ELECTROACOUSTIC PERCUSSION BOARDS: SCULPTURED MUSICAL INSTRUMENTS FOR IMPROVISATION by Tom Nunn, in Leonardo, Vol. 21 #3 (2020 Milvia St., Berkeley, CA 94704).

Tom Nunn's elecroacoustic percussion boards consist of a table-like sheet of plywood on legs, with all manner of small sounding objects mounted on it in such a way that they can be picked up by a contact mic on the underside. This article is a description of the EPB family and its potential.

TOOLS FOR ENVIRONMENTAL RECORDING by Bernard L. Krause, Ph.D., in Signal: Communication Tools for the Information Age (Harmony Books, 225 Park Ave. South, New York NY 10003).

"Signal" is actually the latest whole earth catalog, put together by the regular Whole Earth crew, and containing lots of interesting stuff. The article highlighted here provides an outline and suggestions for equipment required for recording environmental sounds, with an emphasis on animal sounds in the wild.

CREATING AN ACOUSTIC ENSEMBLE by James G. Massey, in 1/1, Vol. 4 #4, Autumn 1988 (535 Stevenson St., San Francisco, CA 94103).

Suggestions for the creation of an ensemble of acoustic instruments capable of playing in consort in just intonation. The instruments described include an adapted fretless guitar, a metal mixing bowl set, and an easily constructed zither for string harmonics, as well as voice and baroque recorders. Also covered in the article are ideas on composition and approach to performance.

CAMERAS IN THE WORKSHOP: WHAT'S IT WORTH TO DOCUMENT INSTRUMENTS ON FILM? by George Manno, in The String Instrument Craftsman, Vol. I #6 (20085 Stevens Creek Blvd., Cupertino, CA 95014).

This article suggests that it's worthwhile to have an effective and convenient arrangement for photographing instruments in the shop, and gives practical suggestions for setting up such an arrangement.

STEINWAY'S LANDMARK 500,000th PIANO, author not credited, in The Music Trades Vol. 136 #10, Oct. 1988 (80 West St., PO Box 432, Englewood, NJ 07631).

This is a promotional piece for Steinway, but it contains interesting information and some informatively detailed photographs. The focus is a fancy grand piano in an angular, contemporary-style casing, built in 1988 to commemorate Steinway's half-a-millionth piano. The article is filled out with a history of Steinway & Sons.

OVATION INSTRUMENTS: AEROSPACE TECHNOLOGY & ACOUSTIC GUITARS, no author credited, in The Music Trades, Volume 136 #11, Nov. 1988 (address above).

Like the piano article noted above, this appears to have been written by the Ovation people for publicity purposes, but it likewise contains interesting information and excellent, explicit photographs. Ovation guitars have one-piece rounded backs and sides made of space age plastic. The article describes the materials and manufacturing process, and also discusses the difficulties in gaining commercial acceptance for an un-traditional approach to a traditional instrument.